

Bi-Scale Radiance Transfer

Abstract

Computer graphics image rendering techniques render images modeling transfer at two scales. A macro-scale is coarsely sampled over an object's surface, providing global effects like shadows and interreflections cast from an arm onto a body. A meso-scale is finely sampled over a small patch to provide local texture. Low-order spherical harmonics represent low-frequency lighting dependence for both scales. To render, a coefficient vector representing distant source lighting is first transformed at the macro-scale by a matrix at each vertex of a coarse mesh, resulting in vectors representing a spatially-varying hemisphere of lighting incident to the meso-scale. A radiance transfer texture specifies the meso-scale response to each lighting basis component, and a function of a spatial index and a view direction. A dot product of the macro-scale result vector with the vector looked up from the radiance transfer texture performs the correct shading integral. An id map places radiance transfer texture samples from a small patch over the object's surface, so that only two scalars are specified at high spatial resolution.